Grains Lay Claim to Health Gains

PEGGY GREB (K10410-1)

A wide variety of foods can be made with barley. From top clockwise, muffins, granola, barley flour, pearled barley, no-bake cookies, vegetable beef barley soup, tabouleh, and pancakes.

PEGGY GREB (K10416-2)

Barley is a very versatile grain. It can be used in soups, stews, cereal, or baked goods. It can be used as a side dish or in a salad. It's also very healthful, because it's low in fat and cholesterol free. So why aren't Americans eating more barley?

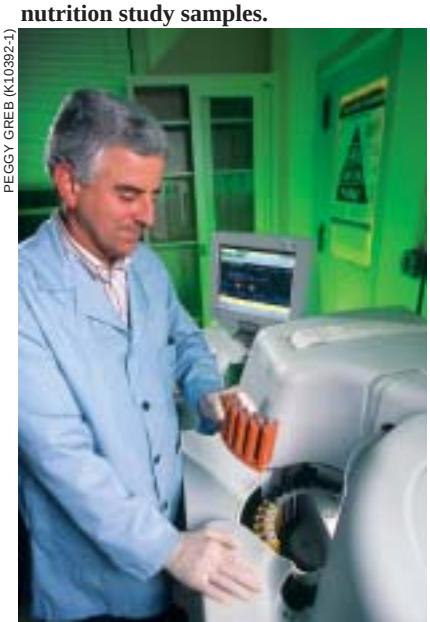
ARS chemist Kay Behall contends that some Americans, especially those who are diabetic and overweight, would be better off doing just that. She's conducting a long-term study to evaluate how eating foods prepared with grains such as barley and oats might reduce risk factors associated with excess weight, type 2 diabetes mellitus, and cardiovascular disease.

Behall is with the Diet and Human Performance Laboratory, part of the Beltsville Human Nutrition Research Center, in Maryland. She and a recently retired colleague, Judith Hallfrisch, conducted several studies to see whether eating a diet high in soluble fiber promotes glucose or hormone changes that result in reduced insulin resistance. Insulin resistance is a diminished sensitivity in body tissues to the action of insulin, which is to bring glucose into those tissues as a source of energy. To compensate for resistance, the pancreas secretes more insulin, an effect that, over time, may exhaust the pancreas's ability to produce insulin.

The presence of diabetes, elevated cholesterol, and high blood pressure increase the risk of heart attack. People suffering from a cluster of abnormalities in glucose and lipid metabolism, high blood pressure, and obesity have what is called Syndrome X. All these various health problems seem to be linked by insulin resistance.

Significant reductions in blood pressure have previously been reported in other high-fiber grain diet studies. Diets rich in soluble fiber also show potential benefits in reducing elevated glucose or insulin in people with impaired glucose tolerance or insulin resistance.

Biologist Dan Scholfield uses a blood-chemistry analyzer to measure health-related metabolites in human nutrition study samples.

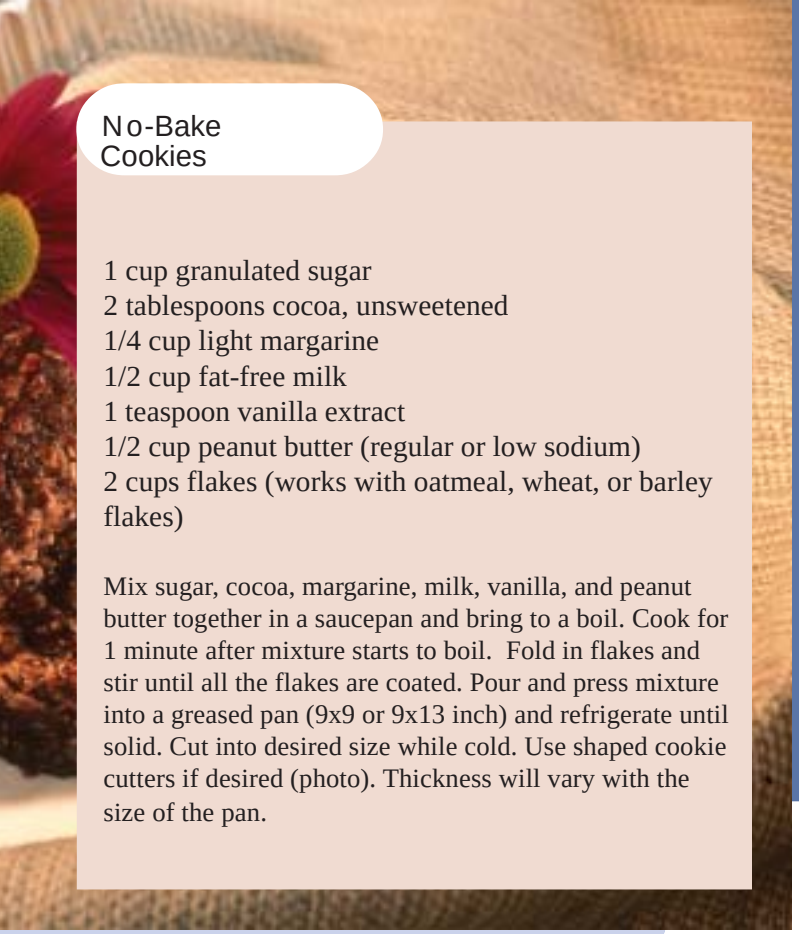


PEGGY GREB (K10392-1)

It is known that the soluble fiber found in oats can reduce cholesterol. Since barley contains similar fiber, the researchers decided to examine its impact in people who eat a healthy diet.

"Oats are widely recognized as promoting beneficial reductions in the rise of glucose and insulin levels after a meal," Behall says. "Barley also has high amounts of soluble fiber, so one should expect similar advantages. Soluble fiber in barley could also help reduce cardiovascular and diabetes risk factors."

Barley production for 2002 was the lowest since 1937. Most barley is used in animal feed or for the production of barley malt for making beer. However, it could add a real boost to the diets of the millions of overweight people in the United States.



No-Bake Cookies

1 cup granulated sugar
2 tablespoons cocoa, unsweetened
1/4 cup light margarine
1/2 cup fat-free milk
1 teaspoon vanilla extract
1/2 cup peanut butter (regular or low sodium)
2 cups flakes (works with oatmeal, wheat, or barley flakes)

Mix sugar, cocoa, margarine, milk, vanilla, and peanut butter together in a saucepan and bring to a boil. Cook for 1 minute after mixture starts to boil. Fold in flakes and stir until all the flakes are coated. Pour and press mixture into a greased pan (9x9 or 9x13 inch) and refrigerate until solid. Cut into desired size while cold. Use shaped cookie cutters if desired (photo). Thickness will vary with the size of the pan.

Chemist Kay Behall (standing) and study volunteer Jo Etta Hubbard discuss the way barley was incorporated into meals prepared in the Human Study Facility.

Behall and Hallfrisch have been investigating whether eating barley and oats can reduce one's glycemic response (a measure of a food's ability to elevate blood sugar) and hyperinsulinemia (when your body produces too much insulin in response to a meal) independent of weight loss. In other words, they want to see whether the grains will have a positive effect on health, even if people are not losing weight.

Two studies, each lasting 17 weeks, were begun in February 2001 and February 2002. The first study involved men, and the second study involved women. Participants followed a healthy diet lower in fat and higher in fiber than that typically consumed by people in the United States. Participants were fed diets rich in barley or grains lower in soluble fiber, such as whole wheat and brown rice.

Although participants were chosen from diverse backgrounds, special interest was given in choosing people identified as having high cholesterol levels. Volunteers had to be dedicated, because all their meals were provided by the laboratory. Samples were collected periodically and measurements made for markers of glycemic control, energy regulation, lipid metabolism, blood pressure, body composition, measures of satiety (feeling of fullness), nutrient digestibility, metabolizable energy, and energy expenditure.

Behall and Hallfrisch are continuing to analyze data. Some early results show that glucose and insulin levels were lowered by diets high in barley. Eating barley-containing foods improved several cardiovascular risk factors. For example, in their study with men, they found that increasing whole grain foods in a healthy diet could reduce blood pressure.

The diet with higher soluble fiber also had the greatest effect on reducing total and low-density lipoprotein (LDL) cholesterol levels, the so-called bad cholesterol.

"On average, total cholesterol was lowered 14 percent in men with previously high cholesterol levels after consuming the fiber-rich diets with low soluble fiber, 15 percent in those following diets with mid soluble fiber, and 21 percent in those following diets with high soluble fiber," Behall says.

Early data from the latest studies shows that these results were more pronounced in postmenopausal women than in premenopausal women. Studies at the laboratory in this area will continue.

"In future studies, we want to determine whether eating moderate amounts of grains over a prolonged period can improve intestinal health and/or increase immunity to disease," Behall says. "We want to learn whether soluble fiber promotes weight-loss maintenance by reducing insulin resistance. And we want to see if this type of diet affects one's satiety after a meal."

Behall also wants to identify phytochemicals or prebiotics found in barley and other grains. These nondigestible fibers have immuno-strengthening properties because they encourage the growth of healthy bacteria in the gut. Researchers will determine their bioavailability and effectiveness. Behall hopes to ultimately identify foods, health practices, and attitudes associated with successful weight loss maintenance.—By **Jim Core,** ARS.

This research is part of Human Nutrition, an ARS National Program (#107) described on the World Wide Web at www.nps.ars.usda.gov.

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